Influence and efficiency of a catalytic stripper in organic carbon removal from laboratory generated soot aerosols

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Abstract

A catalytic stripper (CS) is a device used to remove the semi-volatile, typically organic carbon, fraction by passing raw or diluted exhaust over an oxidation catalyst heated to 300˚C. The oxidation catalyst used in this study is a commercially available diesel oxidation catalyst (DOC), designed to remove volatile hydrocarbon from the diesel exhaust by oxidizing the volatile hydrocarbon species to CO_2 and H_2O (1).

The experimental system consisted of a soot generator, low speed flow tunnel, Scanning Mobility Particle Sizer (SMPS) instrument to monitor the number concentration as well as the size distribution, and a particulate matter (PM) mass measurement system. The PM mass concentration was measured by the filter sampling followed by the thermal/optical carbon analysis, multi-angle absorption photometry (MAAP), photoacoustic measurement, and laser-induced incandescence (LII). The responses of all instruments were evaluated with and without the CS to explore the efficiency of CS in removing the volatile particles. The specific emphasis was placed on the analysis of thermograms and OC and EC sub-fractions from the thermal/optical analysis, and the SMPS data, to gain deeper insights about the size and thermal characteristics of the OC removed by the CS as well as the OC and EC measured downstream of the CS. Influence of different inlet EC/OC ratios, different inlet soot concentrations, and position of the CS in the experimental system were also investigated.

1. Khalek, I. A. (2007). Sampling system for solid and volatile exhaust particle size, number, and mass emissions, SAE Paper 2007-01-0307, Society of Automotive Engineers, Warrendale, MI.